



RESEARCH ARTICLE.....

Effect of different colours of light on performance of caged broilers

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ABSTRACT..... The objective of this study was to evaluate the performance of the broiler chicken (body weight, feed intake and feed conversion ratio) at the fifth week of age. The broiler chicks were weighed, leg banded and distributed randomly into four groups as treatments, battery type iron cages, feeders, waters and other equipments were thoroughly cleaned disinfected, dried, sterilized by blow torch and finally fumigated by use of mixture of KMnO_4 (potassium permanganates) and formaldehyde before use. The chicks were fed *ad libitum* with standard starter ration containing CP: 22 per cent and ME:2900 k.cal./kg feed upto 3 weeks age and then after broiler finisher ration with CP: 19 per cent and ME: 3000 k.cal./kg feed upto 5 weeks age. The broiler chicks of all groups were kept under similar management practices except lighting regimes as per treatment upto five (5) weeks age in battery type iron cages in laboratory. It is concluded colours of light did not show any significant effect on feed intake and feed conversion ratio (FCR) in broilers. The colour of light has a significant effect on the weight gain at the fifth week of age. The milky white and yellow colours of light are effective to obtain higher weekly body weight at five weeks age of caged broilers.

KEY WORDS..... Broiler, Growth rate, Body weight, Colour, Light

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INTRODUCTION.....

Broiler chickens (*Gallus gallus domesticus*) are a gallinaceous domesticated fowl, bred and raised specifically for meat production. The annual growth rate for the year 2012-13 was 7.8 per cent with highest annual growth rate of 13.2 per cent was in 2011-12 due to inclusion of production from commercial poultry (BAHS, 2012). Broilers are usually grown under intensive conditions, but some strains can be grown as free-range

flocks. The breeding stock (broiler - breeders) grown to maturity and beyond but also were welfare issues related to frustration of a high feeding motivation and beak trimming. Light plays a pivotal role for vision and for the release of various hormones, which are important for production, and reproduction of birds. Rierson (2011); Prayitno *et al.* (1997) and Quarles and Kling (1974) reported that performance, growth and behaviour of the birds are directly affected due to the different light

intensity and light regime. For many years, broiler chickens have usually been reared under continuous or near continuous (23L: 1D) photoperiods to maximize feed consumption and growth rate. However, several researcher showed that using continuous light programs several physiological stress responses (Campo and Davila, 2002 and Kliger *et al.*, 2000). Therefore, most of the recent researches have focused on restricting light colours to improve productivity of broiler chickens because the physical activity is very low during darkness and energy expenditure of activity is considerable (Rahimi *et al.*, 2005). Mc Ginnis *et al.* (1966) supplied pullets with filtered in candle scent light from day of age and observed reduced meat production when hens were exposed to an arrow hand of light from either the red, green or blue portions of the spectrum. Schumaier *et al.* (1968) reported that the influence of red, green and blue light angrowth, cannibalism and subsequent meat production was determined on equal number of pullets showed no any significant difference. The significant effect of light on the performance and behaviour of the broiler chicken are studied previously (Blair *et al.*, 1993). Taylor *et al.* (1969) observed that one day-old chicks preferred and yellow lights in comparison with blue light. Birds are sensitive to light even when they are embryos (Aige and Murillo-Ferrol, 1992). Blatchford *et al.* (2009) reported the effect of light on the physiological activity and on the performance. Cherry and Barwick (1962) observed improved feed conversion as intensities were decreased from 107.5 to 1.75 lux. Hoopaw and Goodman (1972); Heshmatollah (2007) and Kondra (1961) reported that the effect of light on the growth and feed efficiency in the broiler chickens. It has also been assumed that lower intensities may improve feed conversion because of a reduction in activity. It is known that the pattern, colour and intensity of lighting can affect many aspects of avian physiology and behaviour, including skeletal and eye development and behavioural rhythms (Nelson and Demas, 1997 and Reiter and Kutritz, 2003). Light stimulation also can impact the ability to cope with stressors (Campo *et al.*, 2007) and has effects on brain organization that influence behavioural responses, including fearful innless (Dharmaretnam and Rogers, 2005). Many studies conducted in various countries showed that among the other management problems, the different colours of light to which the broilers are subjected, have significant effect on the weight gain and

disease problems. Buckland *et al.* (1975) reported that lighting regime had a significant effect on body weight gain; they also reported that birds grown on continuous light had significantly more leg abnormalities than those grown on any of the intermittent colours. Moreover, the incidence of cannibalism is another formidable problem, when light is given on continuous basis. Deaton and Reece (1978) indicated that total light intensity control is required within the broiler house for the entire 24 hours period to obtain maximum feed saving when broilers are maintained reared under an intermittent lighting program. Green light stimulates growth at early age and blue light at market age (Rozenboim *et al.*, 1999). Me Ginnis (1974) reported that the use of red green and blue fluorescent light and stated that colour of the light had no influence on the rate of gain in body weight. Malone *et al.* (1980) who reported that the weight gained by the bird when kept an intermittend lighting programme was significantly better then continuous light. An interaction effect was recently observed between intensities of 1 and 0.1 foot candle and photoperiods of 23L: 1D and 18L: 6D on broiler body weight and parts yields (Lien *et al.*, 2007). Recent research has indicated that light source may affect body weight, immune response, liveability and health status. Broiler behaviour is strongly affected by light sources (Ghuffar *et al.*, 2009). Light is the fundamental source of energy which directs life process directly or indirectly organisms. Long before the role of light in poultry production will be subject scientific study on the effect of light on the broilers.

RESEARCH METHODS.....

The present experiment was carried out in small animal laboratory of Sundaresan school of Animal Husbandry and dairying, SHIATS Allahabad, U.P. A total of 48 DOC (day old chicks) of same hatch were procured and randomly distributed in four (4) groups as treatments T₁, T₂, T₃ and T₄ were yellow colour, milky white colour, green colour and blue colour of light, respectively. The broiler chicks were weighed, leg banded and distributed randomly into four groups as treatments.

- | | |
|------------------------|---|
| Group T ₁ - | Broiler chicks reared under yellow coloured light. |
| Group T ₂ - | Broiler chicks reared under milky white coloured light. |
| Group T ₃ - | Broiler chicks reared under green |

Group T₄- coloured light.
Broiler chicks reared under blue coloured light.

Chicks were housed in battery type iron cages providing 0.8 sq. Ft. /bird space. The chicks were fed *ad libitum* with standard starter ration containing CP: 22 per cent and ME:2900 k.cal./kg feed upto 3 weeks age and then after broiler finisher ration with CP: 19 per cent and ME: 3000 k.cal./kg feed upto 5 weeks age as per BIS (1997) specification for energy and protein. The broiler chicks of all groups were kept under similar management practices except lighting regimes as per treatment upto five (5) weeks age in battery type iron cages in laboratory.

Analysis of experimental data :

The data on body weight, feed consumption were recorded weekly, tabulated and statistically analyzed as per (Snedecor and Conhran, 1994) in Randomized Block Design (RBD) consisting of four treatments. The FCR

was calculated by using following formula (Ratsaka *et al.*, 2012).

$$\text{FCR} = \frac{\text{Feed given (g)} - \text{Feed remaining (g)}}{\text{Chicken weight change (g)}}$$

The analysis was done for day old chicks, body weight, feed intake, average mean in weight gain and feed conversion ratio at the fifth week of age (Table 1 to 6).

RESEARCH FINDINGS AND ANALYSIS.....

The overall performance of the broiler birds are summarized in the Table 6. From the perusal of data on body weight of day old chicks randomly distributed in different treatments contained in Table 1. The body weight of chicks in general ranged from 41.33 to 50.33 g. The highest mean body weight of day old chicks (DOC) was recorded in T₁ (47.08) followed by T₄ (46.83), T₃ (46.25) and T₂ (44.74). The differences in these values of different treatments were found non-significant which indicated the random distribution of DOC among different

Table 1: Average body weight (g) of day old broilers chicks (DOC) in four different treatments

| Replication | Body weight of DOC (g) | | | |
|----------------|------------------------|----------------|----------------|----------------|
| | T ₁ | T ₂ | T ₃ | T ₄ |
| R ₁ | 50.33 | 44.33 | 45.00 | 48.33 |
| R ₂ | 48.00 | 46.67 | 48.33 | 49.00 |
| R ₃ | 41.33 | 44.33 | 42.67 | 45.00 |
| R ₄ | 48.67 | 44.33 | 49.00 | 45.00 |
| Mean | 47.08 | 44.74 | 46.25 | 46.83 |

Table 2: Average body weight (g) of broilers at fifth week of age in different treatments

| Replication | Average body weight (g) of broilers at five week of age | | | |
|----------------|---|----------------|----------------|----------------|
| | T ₁ | T ₂ | T ₃ | T ₄ |
| R ₁ | 700.00 | 770.00 | 683.33 | 641.67 |
| R ₂ | 760.00 | 766.67 | 668.33 | 653.33 |
| R ₃ | 760.00 | 651.67 | 691.67 | 678.33 |
| R ₄ | 663.33 | 705.00 | 670.00 | 695.00 |
| Mean | 720.83 | 723.33 | 678.33 | 667.08 |

Table 3: Average feed intake (g) per broiler during fifth week of age

| Replication | Average feed intake (g) of broiler at fifth week of age | | | |
|----------------|---|----------------|----------------|----------------|
| | T ₁ | T ₂ | T ₃ | T ₄ |
| R ₁ | 320.00 | 342.00 | 240.00 | 285.00 |
| R ₂ | 315.00 | 318.33 | 230.00 | 280.00 |
| R ₃ | 360.00 | 260.00 | 327.00 | 315.00 |
| R ₄ | 320.00 | 350.00 | 300.00 | 310.00 |
| Mean | 328.75 | 317.58 | 274.25 | 297.50 |

groups of treatments of the experiments and it was proper and unbiased. The highest mean body weight of broilers at five week age was recorded in T₂ (723.33) followed by T₁ (720.83), T₃ (678.33) and T₄ (667.08). However, the differences in the values of body weight of broilers due to different treatments of colours of light were found non-significant during five week of age. These results are similar to the previous finding of Schumaier *et al.* (1968) who reported that no any significant difference of red, green and blue light on growth. McGinnis (1974) reported that the use of red green and blue fluorescent light and stated that colour of the light had no influence on the rate of gain in body weight. Contrary to this Agarwala and Paul (1975) reported that the effect of different colours of light on chicks growth was significantly by blue light when composed to any other lights as green, white and red and feed consumption in red light was the lowest and highest in white light. Buckland *et al.* (1975) also reported that lighting regime

had a significant effect on body weight gain. The highest mean feed intake per broiler during fifth week of age was recorded in T₁ (328.75), T₂ (317.58), T₄ (297.50) and T₃ (274.25). However the differences in the values of feed intake of broilers due to different treatments of colours of light were found non-significant, during fifth week of age. The FCR per chick during fifth week of age in general ranged from 1.49 to 1.92 kg. The highest mean average FCR per chicks at the five week was recorded in broilers of T₄ (1.86) followed by T₁ (1.75), T₃ (1.73) and T₂ (1.68) kg. However the differences in the values of feed conversion ratio of broilers due to different treatments of colours of light treatments were found non-significant during fifth week of age. Contrary to this result Deaton and Reece *et al.* (1978) reported that the light control is required within the broiler house to obtain maximum feed conversion when broilers are maintained reared different lighting programme. Cherry and Barwick (1962) also observed lower intensity light

Table 4: Averages weekly mean gain in weight (g) per broiler of different treatments

| Weeks | Averages mean gain in weight (g) of different treatment | | | | |
|----------------|---|----------------|----------------|----------------|--------|
| | T ₁ | T ₂ | T ₃ | T ₄ | Mean |
| W ₁ | 72.33 | 68.00 | 63.33 | 65.16 | 67.20 |
| W ₂ | 126.75 | 133.92 | 121.33 | 125.75 | 126.93 |
| W ₃ | 112.08 | 107.16 | 125.75 | 115.16 | 115.03 |
| W ₄ | 161.61 | 181.33 | 157.58 | 157.08 | 164.28 |
| W ₅ | 201.41 | 187.83 | 164.08 | 157.08 | 177.60 |
| Mean | 134.74 | 135.64 | 126.41 | 124.04 | 130.20 |

Table 5: Average feed conversion ratio (FCR) per broiler during fifth week of age (kg. feed per kg. of weight gain):

| Replication | Feed conversion ratio of broilers at fifth week of age | | | |
|----------------|--|----------------|----------------|----------------|
| | T ₁ | T ₂ | T ₃ | T ₄ |
| R ₁ | 1.71 | 1.49 | 1.87 | 1.92 |
| R ₂ | 1.73 | 1.85 | 1.79 | 1.89 |
| R ₃ | 1.67 | 1.82 | 1.74 | 1.83 |
| R ₄ | 1.90 | 1.56 | 1.55 | 1.80 |
| Mean | 1.75 | 1.68 | 1.73 | 1.86 |

Table 6 : Mean performance of broilers under different colour of light in caged rearing system

| Sr. No. | Parameters | Different treatment groups | | | |
|---------|--|----------------------------|---------------------|----------------------|---------------------|
| | | T ₁ | T ₂ | T ₃ | T ₄ |
| 1. | Body weight of DOC(g) | 47.08 | 44.74 | 46.25 | 46.83 |
| 2. | Body weight at five week of age (g) | 720.83 ^{ab} | 723.33 ^a | 678.33 ^{bc} | 667.08 ^c |
| 3. | Feed intake per broiler in five weeks (g) | 328.75 | 317.58 | 297.50 | 274.25 |
| 4. | Average feed conversion ratio (kg) | 1.75 | 1.68 | 1.73 | 1.86 |
| 5. | Average gain in weight per broiler in five weeks (g) | 134.74 | 135.64 | 126.41 | 124.04 |

Means bearing superscripts in lower case letters in column differ significantly (P<0.05)

colour may improve feed conversion. The mean gain in weight per broiler irrespective of different treatments during I, II, III, IV and V week of age was 67.20, 126.93, 115.03, 164.26 and 177.60 g, respectively. Highest mean body weight of broilers at five week age was recorded in T₂ (135.64) followed by T₁ (134.74), T₃ (126.41) and T₄ (124.04): however, the differences in the values of gain in body weight of broiler due to different treatments of colours of light were found non- significant during five week of age.

Conclusion :

It may be concluded that colours of light did not show any significant effect on feed intake, average

gain in weight and feed conversion ratio (FCR) in broilers. The colour of light has a significant effect on the weight gain at the fifth week of age. The milky white and yellow colours of light are effective to obtain higher weekly body weight at five weeks age of caged broilers.

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